CLAIMS

What is claimed is:

1. A sonar beamforming system, comprising in combination:

a forward-looking sonar having transmit and receive transducer arrays and a beamforming device; and

at least one side-looking sonar having multi-element arrays and a beamforming device.

2. The system of claim 1, further comprising a downward-looking sonar for high-resolution terrain and object identification.

3. The system of claim 1, wherein at least one of the forward-looking sonar and at least one side sonar are mounted on a pivotable motorized array.

4. The system of claim 1, wherein at least one of the forward-looking sonar and the side-looking sonar include multi-mode arrays for at least a detection mode and an identification mode.

5. The system of claim 1, wherein the system further comprises multi-element acoustic communication receive arrays.

6. A water craft, comprising in combination at least one of:

a forward-looking sonar having a transmit and receive transducer array and a beamforming device; and

a side-looking sonar having multi-element arrays and a beamforming device.

7. A forward-looking sonar comprising in combination:

a bistatic transducer array having a first transmit transducer array and a second receive transducer array;

a beamforming device; and

a processing unit.

8. A method for forming an integrated image comprising the steps of:

obtaining array signals from a forward-looking sonar;

obtaining array signals from at least one side-looking sonar;

normalizing the array signals from the forward-looking sonar and the at least one side-looking sonar to generate normalized data; and

fusing the normalized data to generate an image.

9. An underwater unmanned vehicle system comprising in combination:

a forward-looking sonar having a transmit and receive transducer array and a beamforming device; and

at least one side-looking sonar having a second transducer array and a beamforming device.

10. The system of claim 9, further comprising a downward-looking sonar for high-resolution terrain and object identification.

11. The system of claim 9, wherein at least one of the forward-looking sonar and at least one side sonar are mounted on a pivotable motorized array.

12. The system of claim 9, wherein at least one of the forward-looking sonar and the side-looking sonar include multi-mode arrays for at least a detection mode and an identification mode.

13. The system of claim 9, wherein the system further comprises multi-element acoustic communication receive arrays.

14. The system of claim 9, wherein the beamforming device further comprises a plurality of charge domain delay lines.

15. The system of claim 9, wherein the beamforming device comprises a sampling circuit connected to a programmable delay circuit, a weighting circuit, and a summing circuit.

16. The system of claim 9, further comprising a memory circuit connected to the beamforming device.

17. The system of claim 16, further comprising an interface controller connected to the memory circuit.

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18. The system of claim 17, further comprising a Firewire interface connected to the interface controller and the memory circuit, the Firewire interface communicating with a central processor.

19. The system of claim 9 wherein the beamforming device comprises a charge domain delay line.

20. The system of claim 19 further comprising a plurality of charge coupled device delay lines, each delay line having a programmable tap selection circuit.

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